

An Account of Neotenic Species of *Rhaphidophora* Hassk. (Araceae-Monsteroideae-Monstereae) in New Guinea and Australia

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Abstract

An account of the neotenic *Rhaphidophora* Hassk. species in New Guinea and Australia is presented as a precursor to the Flora Malesiana and Flora of Australia accounts. Three species, two (*R. hayi*, and *R. okapensis*) new to science, are described, together with a brief discussion of neoteny in monsteroideae. A key is provided. All species are illustrated.

Introduction

Rhaphidophora in New Guinea, the western tropical Pacific, and Australia comprises in excess of 30 species of which all, except *R. korthalsii* Schott, are endemic to the region (Hay, 1981, 1990, 1993; Hay *et al.*, 1995; Nicolson 1978, 1979). Work for the Flora of Australia Araceae account (Hay, in press) has revealed that the species commonly referred to as *R. pachyphylla* K. Krause comprises two distinct taxa, one hitherto undescribed. It is this undescribed element that is present in Australia, which was reported by Hay (1993) and illustrated by Jones & Gray (1988: 322) as *R. pachyphylla*. During preparation of the description of this new taxon, to be called *R. hayi*, it became apparent that a remarkable second undescribed species, so far known only from the Eastern Highlands of Papua New Guinea, was represented among specimens on loan to K. This is here described as *R. okapensis*.

Although *Rhaphidophora hayi* is certainly distinct from *R. pachyphylla*, it is still not clear whether *R. pachyphylla* as here now redefined represents a single taxon. A specimen from high altitude in New Guinea differs, aside from representing an extreme altitudinal increase on the other specimens seen, in a shortly stipitate spadix, and a markedly rounded spathe apex. More specimens of '*R. pachyphylla*' from higher elevation are required to resolve this plant's status.

This is one of a series of papers intended to present a complete alpha-taxonomy of the genus *Rhaphidophora* in Asia. Accounts for the Himalaya, Thailand and Indochina, Peninsular Malaysia and Singapore

(Boyce, 1999), the Indonesian archipelago excluding Borneo and Irian Jaya, the Philippines (Boyce, 2000). Borneo, and Papuasia are being prepared and will be published separately. All morphological terms employed follow Stearn (1992).

Neoteny in Monstereae

The three *Rhaphidophora* species discussed here display neotenic habit: plants retaining juvenile vegetative morphology at sexual maturity. Neoteny in Monstereae appears to be of two types, obligate or facultative, defined as to whether a species is habitually neotenic, or whether certain individuals display a neotenic habit, and others do not.

The obligate species can be further divided into those that undergo no change in their vegetative morphology at flowering (complete neoteny), and those that produce a token adult phase at flowering, e.g., a shingling species producing slightly scattered leaves on flowering shoots. *Rhaphidophora okapensis* belongs to the first group, *R. hayi* to the second.

Complete neoteny is a feature of a very few species of *Rhaphidophora*. Aside from *R. okapensis*, only *R. latevaginata* M. Hotta (Borneo) has this character. *R. latevaginata* differs from *R. okapensis* in flowering at the tips of adherent shingling shoots, by the much larger, oblong, truncate-based leaf laminae, and by the considerably larger inflorescence. Elsewhere in the Monstereae only *Scindapsus lucens* Bogner & P.C. Boyce (Sumatera, Peninsular Malaysia), and neotropical *Monstera tuberculata* Lundell are known to be completely neotenic.

Facultative neoteny is so far known to occur in the widespread *R. beccarii* (Engl.) Engl. (neotenic plants lacking the leaf lamina division prominent in the typical form have been described as *R. fluminea* Ridl.), and is occasionally observed in *Epipremnum pinnatum* (L.) Engl..

It appears from the above that neoteny in the Monstereae may have arisen independently several times.

Key to Neotenic *Rhaphidophora* in New Guinea and Australia

- 1a. Leaf base cordate on flowering shoots. Styler region conical **2. *R. okapensis***
- 1b. Leaf base truncate, acute or cuneate on flowering shoots. Styler region truncate. **2**
- 2a. Flowering shoots with base of leaf lamina truncate; spadix stipitate, stigma elongated, longitudinally orientated. Plant with disarticulating

- side shoots functioning as vegetative propagation units **1. *R. hayi***
 2b. Flowering shoots with base of leaf lamina acute to cuneate; spadix sessile, stigma punctiform. Plant without disarticulating side shoot ..
 **3. *R. pachyphylla***

1. *Rhaphidophora hayi* P.C. Boyce & Bogner, *sp. nov.*

Rhaphidophora pachyphylla auctt. Austr. non K. Krause

A *R. pachyphylla* laminis latioribus basi truncatis, stigmatibus maioribus elatis oblongis in spadice longitudinaliter positis; ramis lateralibus brevibus liberis leviter in frangentibus ad propagationem vegetativam pertinentibus differt— TYPUS: Australia, Queensland, Cooroo Lands, north Johnstone River, near Innisfail, Nov 1965, *Webb & Tracey* 7066 (BRI, holo).

Figure 1.

Moderate-sized, slender to somewhat robust, semi-leptocaul, homeophyllous neotenic liane to 5 m; *seedling stage* a non-skototropic shingling juvenile shoot; *pre-adult plants* forming small terrestrial colonies; *adult shoot* architecture comprised of clinging, physiognomically unbranched, mostly densely leafy, sterile stems and abbreviated, free, fertile stems; *stems* rectangular-terete in cross section, widest side prominently convex, smooth, dark green, without prophyll and cataphyll fibre but with very thin, adherent, petiolar sheath tissue, internodes to 8 x 1 cm, separated by slight $\pm$ straight scars, older stems sub-woody; *flagellate foraging stems* weakly developed, usually at least partially leafy and mostly replaced by short, readily disarticulating free side shoots functioning as vegetative propagation units; *clasping roots* arising from the internodes, prominently pubescent; *feeding roots* c. 3 mm diam., brown, minutely pubescent, sparsely lenticellate; *leaves* distichous, shingling on adherent shoots, densely arranged or slightly scattered on free shoots, scattered leaves with internodes between carrying a prominent cataphyll of short duration; *cataphylls and prophylls* membranous, soon drying and falling; *petiole* deeply grooved, 1–2 x 0.2–0.3 cm, smooth, apical and basal genicula barely visible; *petiolar sheath* prominent but soon drying and adhering to stem while falling from petiole, membranous, ligulate, margins of ligule fused, the ligule extending up to 3 cm above base of lamina and enclosing shoot apex; *lamina* broadly to narrowly ovate-elliptic, stiffly coriaceous, base truncate to cuneate or cordate (the last not on flowering shoots), and briefly decurrent, apex acute with a tiny tubule; *midrib* prominently raised abaxially, slightly raised adaxially; *primary venation* densely pinnate, slightly raised abaxially, somewhat impressed adaxially; *interprimaries* sub-parallel to primaries, slightly raised



Figure 1. *Rhaphidophora hayi* P.C. Boyce & Bogner

A. adult shoot with flowering branch $\times \frac{1}{3}$; B. leaf lamina $\times +$; C. venation detail $\times 3$; D. pre-adult climbing shoot $\times +$; E. disarticulating side shoot $\times \frac{1}{3}$; F. inflorescence $\times 1$; G. spadix detail at female receptivity $\times 10$; H. spadix detail at post anthesis $\times 10$. A–C from Webb & Tracey 7066; D–H from Sands, Pattison & Wood 2384.

on both leaf surfaces; *secondary venation* reticulate, slightly raised abaxially, $\pm$ flush adaxially; *inflorescence* solitary, subtended by a membranaceous prophyll and one or more cataphylls, these soon falling; *peduncle* slightly laterally compressed, 2–3 x 0.6–1 cm; *spathe* canoe-shaped, stoutly beaked, 5.5–8 x 2–4 cm, stiffly fleshy, yellow, gaping wide at female receptivity and then slowly falling to leave a large scar at the base of the spadix; *spadix* stoutly cigar-shaped, shortly stipitate; *stipe* 4–6 x 3–3.5 mm; *spadix* inserted $\pm$ level on stipe, 3.5–6 x 1–1.2 cm, yellow; *stylar* region weakly developed, mostly irregularly rhombohexagonal, 1–1.3 x 1–1.1 mm, truncate; *stigma* prominently raised, elongated, longitudinally orientated, c. 0.3–0.5 x 0.2–0.4 mm; *anthers* not exerted at anthesis; *infructescence* not seen.

Distribution: Irian Jaya, Papua New Guinea [including New Britain, New Ireland, Bougainville and Muyua (Woodlark) Island], and Australia (Eastern tropical Queensland).

Habitat: Primary, secondary and monsoonal rain forest on coralline limestone and basalt, 20 – 600 m altitude.

Note: While resembling *Rhaphidophora pachyphylla* K. Krause, *R. hayi* is immediately distinguishable by the flowering shoots with broader, truncate-based leaf laminas, the raised, larger, elongated, longitudinally orientated stigmatic region, the occasional foraging shoot, and by the presence of free, disarticulating side shoots functioning as vegetative propagation units. This last character is unique in the Monsteroideae.

Other specimens seen: INDONESIA: Irian Jaya, 2 km N of Manokwari, *Nicolson* 1577 (B, K, L, US). PAPUA NEW GUINEA: Woodlark (Muyua) Island, Kulumadau, *Brass* 28831 (GH, L); Milne Bay, Esa'ala subdistrict, Normanby Island, Sewa Bay, 21 Oct 1971, *Lelean & Streimann* LAE 52541 (L, US); Cnetral Prov., Sogeri Plateau, 5–7 miles beyond Kokoda Trail Monument, 30 miles east of Port Moresby, *Nicolson* 1431 (L, US); Bougainville, Arawa, McKillup's Plantation, 6 km west of Kieta, *Nicolson* 1512 (B, K, US), New Britain, Kandrian, along road from airport, *Nicolson* 1540 (L, US); New Ireland, Namatanai, Hans Meyer Range, above Mandih river, near Mandih Lake, c. 6 km WNW of Taron, 30 Oct 1975, *Sands, Pattison & Wood* 2384 (K & K (living collection accession no. 1975-5026) & K (spirit no. 63938)). AUSTRALIA: Queensland, Cape Tribulation, *Rijkers* 1484 (BRI). There are many collections from Australia (mostly at BRI and QRS) but all, except that cited here, are sterile and are not included here.

2. *Rhaphidophora okapensis* P.C. Boyce & Bogner, *sp. nov.*

A *Rhaphidophora okapensis* differt ab omnibus speciebus ceteris Novae Guineae ramis rigide erectis, laminis foliorum parvis valde coriaceis ovato-cordatis longe acuminatis, inflorescentiis amplis purpureis differt — TYPUS: Papua New Guinea, Eastern Highlands, 5 miles NE of Okapa, 24 Sept 1964, Hartley TGH 13098 (CANB, holo; GH, L, iso).

Figure 2.

Moderate, lightly robust, semi-leptocaul, homeophyllous neotenic liane to unknown ultimate height; *seedling stage* and *pre-adult plants* not observed; *adult shoot* architecture comprised of clinging, physiognomically unbranched, densely leafy, sterile stems, and adherent, leafy fertile stems; *stems* terete in cross section, smooth, without papery adherent prophyll, cataphyll and petiolar sheath remains, internodes to 5 x 0.75 cm, separated by slightly swollen nodes with rather $\pm$ sloping scars, older stems sub-woody; *flagellate foraging stems* not observed; *clasping roots* arising sparsely from the internodes, smooth to very slightly pubescent; *feeding roots* not observed; *leaves* distichous, those on adherent shoots weakly shingling to slightly scattered, those on free shoots pendent to slightly spreading; *cataphylls* and *prophylls* membranous, soon drying and falling; *petiole* shallowly and broadly grooved, 1–4 x 0.1–0.2 cm, smooth, apical and basal genicula quite prominent; *petiolar sheath* prominent, membranous, ligulate, ligule extending c. 1.5 cm beyond apical geniculum, soon drying and adhering to stem, later disintegrating and falling; *lamina* ovate, mid-green above, paler below, very stiffly coriaceous, base cordate to rounded and slightly notched, apex long acuminate with a pronounced tubule; *midrib* proximally raised abaxially, slightly impressed adaxially; *primary venation* pinnate, slightly raised on both leaf surfaces; *interprimaries* sub-parallel to and barely distinguishable from primaries, slightly raised on both leaf surfaces; *secondary venation* reticulate, slightly raised abaxially and adaxially; *inflorescence* solitary on short leafy shoots, subtended by a fully developed or reduced foliage leaf, and a membranous, soon-degrading, long-ligulate prophyll; *peduncle* terete, 4–6 x 0.15–0.2 cm; *spathe* broadly canoe-shaped, rounded, minutely apiculate, 3–3.5 x 1.2–1.5 cm, stiffly fleshy, yellow, turning purple, falling to leave a large scar at the base of the spadix; *spadix* stout-cigar-shaped, stipitate, inserted level on stipe, 1.9–2.2 x 0.75–1 cm; *stipe* 4–4.5 x 1–1.2 mm; *stylar* region conical, regularly rhombohexagonal in plan view, 0.8–1 x c. 1 mm; *stigma* slightly raised, punctiform, c. 0.4 mm diam.; *anthers* exerted at anthesis; *infructescence* not seen.



Figure 2. *Rhaphidophora okapensis* P.C. Boyce & Bogner

A. adult shoot with flowering branch $\times \frac{3}{4}$; B. leaf lamina $\times 1$; C. venation detail $\times 4$; D. inflorescence $\times 1+$; E. spadix detail at anthesis $\times 10$; F. pistil, side view $\times 10$. All from from Hartley 13098.

Distribution: Papua New Guinea, known only from the type.

Habitat: Disturbed mixed forest on slope. c. 1500 m altitude.

Note: A very distinctive species notable for the stiffly erect, densely leafy stems, the thickly coriaceous, ovate-cordate leaves with a long acuminate tip, the relatively large inflorescences that turn purple at maturity, the long-stipitate spadix, and the conical stigmatic region. Based on overall appearance, it is not immediately obvious to what *R. okapensis* is related. It is included here on account of its neotenic habit, a character that might lead to confusion with the preceding species.

3. *Rhaphidophora pachyphylla* K. Krause

Rhaphidophora pachyphylla K. Krause, Bot. Jahrb. Syst. 49 (1912): 92 — Type: Papua New Guinea, Madang Province, near Wabbe, 29 Aug 1907, Schlechter 16463 (B, holo; P, iso)

Figure 3.

Moderate to rather large, somewhat robust, semi-leptocaul, homeophyllous neotenic liane to 5 m; *seedling stage* a non-skototropic shingling juvenile shoot; *pre-adult plants* forming small terrestrial colonies; *adult shoot* architecture comprised of clinging, physiognomically unbranched, mostly densely leafy, sterile stems and, free, leafy fertile stems; *stems* rectangular-terete in cross section, widest side prominently convex, smooth, mid-green, mostly without prophyll, cataphyll and petiolar sheath fibre although flowering shoots occasionally and briefly with parchment-like remains, internodes to 3 x 1 cm, separated by rather prominent $\pm$ straight scars, older stems sub-woody; *flagellate foraging stems* absent; *clasping roots* arising sparsely from the internodes, pubescent; *feeding roots* not observed; *leaves* distichous, those on adherent shoots shingling, those on free shoots slightly spreading, all densely arranged; *cataphylls* and *prophylls* membranous, soon drying and falling; *petiole* deeply grooved, 1.5–4 x 0.15–0.2 cm, smooth, apical and basal genicula quite prominent; *petiolar sheath* prominent, membranous, ligulate, slightly unequal on one side, of short-duration, degrading to very weak fibres and soon falling; *lamina* narrowly ovate-elliptic, stiffly coriaceous, base acute to cuneate, apex acute with a short tubule; *midrib* prominently raised abaxially, slightly impressed adaxially; *primary venation* pinnate, slightly raised abaxially, somewhat impressed adaxially; *interprimaries* sub-parallel to primaries, slightly raised on both leaf surfaces; *secondary venation* weakly reticulate, slightly raised abaxially, $\pm$ flush adaxially; *inflorescence* solitary on short to somewhat elongated



Figure 3. *Rhaphidophora pachyphylla* P.C. Boyce & Bogner

A. section of adult climbing shoot with flowering branch $\times +$; B. section of adult climbing shoot $\times +$; C. juvenile climbing shoot $\times \frac{1}{3}$; D. pre-adult climbing shoot $\times +$; E. leaf lamina $\times +$; F. venation detail $\times 4$; G. inflorescence, spathe fallen $\times 1+$; H. spadix detail, post anthesis $\times 10$. A, E – F, G-H from *Schlechter 16436*; B from *Kalkman 3389*; C–D from *Nicolson 1416*.

leafy shoots, subtended by a fully developed foliage leaf, and soon-degrading membranous prophyll; *peduncle* terete, 4–7 x 0.2–0.25 cm; *spathe* broadly canoe-shaped, obtuse to slightly pointed, 5–6.5 x 1.5–2.2 cm, stiffly fleshy, yellow, gaping at female receptivity and then falling to leave a large scar at the base of the spadix; *spadix* narrowly cigar-shaped, long stipitate; *stipe* 6–10 x 2–2.4 mm; *spadix* inserted obliquely on stipe, 4–5.5 x 1.2–1.6 cm, yellow; *stilar* region weakly developed, mostly irregularly rhombohexagonal, 1–1.2 x 1–1.4 mm, truncate; *stigma* slightly raised, punctiform, c. 0.2–0.3 x 0.3–0.35 mm; *anthers* slightly exerted at anthesis; *infructescence* not seen.

Distribution: Irian Jaya, Papua New Guinea.

Habitat: Monsoonal lowland rainforest at 10–30 m altitude (2380 m in montane *Nothofagus* forest Hoogland & Schodde 6943).

Notes: 1. *Rhapidophora pachyphylla* differs from *R. hayi* in leaf shape and form of the stigma. In addition, *R. pachyphylla* lacks the disarticulating shoots unique to *R. hayi* and never has foraging shoots.

2. As noted above, it is still not fully clear whether *R. pachyphylla* as here defined is a single taxon. The collection Hoogland & Schodde 6943 cited below, and for which habitat and elevation data appear in parentheses above, while vegetatively typical of *R. pachyphylla*, has a markedly rounded spathe apex, a shorter stipe (c. 3 mm long) and also represents an enormous altitudinal increase on the other specimens seen. More specimens of '*R. pachyphylla*' from higher altitude are required to resolve this plant's status.

Other specimens seen: INDONESIA: Tamimonding, Kalkman s.n. (L); Merauke, Bis, Agats, Widjaja 6344 (BO, K, L). PAPUA NEW GUINEA: Western Highlands, Wabag subdistrict, near Poio village, west slopes of lower Yaki valley, 6 July 1960, Hoogland & Schodde 6943 (BM, GH, L); Brown River F.R., 20–25 miles northwest of Port Moresby, Nicolson 1416 (K, L, US).

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Brass 28831: **1**; *Hartley* 13098: **2**; *Hoogland & Schodde* 6943: **3**; *Kalkman s.n.*: **3**; *Lelean & Streimann LAE* 52541: **1**; *Nicolson* 1416: **3**; 1431, 1577: **1**; *Rijkers* 14841: **1**; *Sands, Pattison & Wood* 2384: **1**; *Schlechter* 16436: **3**; *Webb & Tracey* 7066: **1**; *Widjaja* 6344: **3**.